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uncle, but not till after his classical "Rapport" (of 1867, not 1868, as on pp. 201, 234, 426); quite rightly, he is always referred to in the text by his paternal name, without the later addition, and should be so noted in the index. Under "Schiller" philosophy has been substituted for history. "Ænesidemus" is correctly printed under "Schulze, G. E.," incorrectly on p. i of the index. Under "Ueberweg," T. M. should be substituted for J. M. Lindsay; and "Taylor" should read Tayler. The caption "Cause and effect defined" should be thoroughly revised and extended. There are several references in the text of far greater importance than the single one recorded in the index.

R. M. WENLEY

ANN ARBOR

Electrical Machine Design. By ALEXANDER GRAY. McGraw Hill Book Company.

"Electrical Machine Design," by Alexander Gray, discusses the theory of operation and design of direct current generators and motors of both interpole and non-interpole type, alternating current generators, induction motors and transformers. Five hundred and seven pages are not enough to cover such a range of subjects satisfactorily, and when the analysis of theory is carried to the extent attempted by Mr. Gray the result can not be a success. Considered as a text-book, it would be unsuited to the average fourth-year student, not because the analyses are too involved for such, but because their introductions are too brief. The calculation of temperature gradient may be taken as an example. If a few paragraphs had been inserted discussing the laws governing flow of heat, and containing perhaps a simple application, the subsequent treatment would have been much more easily understood. The same criticism is applicable to the chapter on armature reactions in alternators.

Considered as a book for reference purposes, this work contains much matter of value, both to the student and to the designer. Discussions of such questions as noise of induction motors; comparative value of shell and core type transformers, short pitch windings

in direct current machines, are really valuable and are not to be found readily elsewhere. The subjects of commutation and insulation are very well developed.

The arrangement of subject matter is usually excellent. The treatment of the induction motor had better have followed that of the transformer instead of preceding it. Such an arrangement would have made possible the consideration of the induction motor as a transformer, a most practical and effective method. The theory of operation and construction of each type of apparatus is first developed. This is followed by the procedure in design, the discussion of special types of machines, and a chapter on specifications. Examples accompany the text and should aid the student materially in his comprehension of the subject.

The book compares favorably with the other books on design in our language, but when it is contrasted with the simple and extremely logical treatments to be found in the works of Arnold, its own shortcomings are most apparent.

C. W. GREEN

METEOROLOGICAL OBSERVATIONS AT THE UNIVERSITY OF CALIFORNIA

It is probably due to the fact that the public interest in meteorology is centered around weather forecasts that the science has received so little attention from the universities of the United States. The University of California is one of the relatively small number which has maintained a regular series of observations for a considerable period.

Until July 1, 1912, when the routine meteorological work at Berkeley was transferred to the department of geography under which the courses in meteorology and climatology are listed, the astronomy departments, the Lick Observatory at Mount Hamilton and the Students' Observatory at Berkeley, carried on the principal meteorological observations of the university. Meteorological observations have always been a part of the regular work of the Lick Observatory and, when the Students' Observatory was established at Berkeley, its ac-

tivities included meteorological work as a voluntary observer's station of the United States Signal Service. The first rain-gauge was set up on October 16, 1886, and the meteorological work may be dated from that time. A synopsis of the results of the observations for the twenty-five years ending July 1, 1912, has been prepared by the director of the observatory and is soon to be published in the University of California Publications in Geography, which will contain, among other geographic papers, the results of the meteorological observations and climatic studies made at the University of California.

There is, perhaps, no type of work in which so much depends upon the daily exacting attention to detail as meteorology. An observation missed in this work is lost forever; an approximate figure may be obtained and used in the preparation of the averages, but the greatest value of meteorological work depends upon an unbroken and regular series of observations. Such a series is that which was obtained by the Students' Observatory at Berkeley during a period of nearly twenty-six years. From the establishment of the meteorological station until September, 1892, the observations were made three times daily, at 7 A.M., 2 P.M. and 9 P.M., and the results sent to the signal service at the end of each month. From September 1, 1892, observations have been made at 8 A.M. and 8 P.M., Pacific Standard Time, the standard time in use in the state of California. The transfer of the meteorological work from the signal service of the War Department to the Weather Bureau of the United States Department of Agriculture in no way broke the continuity of the record at Berkeley; the relations which were established with the signal service have been continued with the Weather Bureau.

The plans of the signal service for the work of the voluntary observers proved to be somewhat more detailed than seemed desirable under the conditions of the service and in the early nineties a simplified form of report was adopted. As far as the reports to the Weather Bureau were concerned the University of

California conformed to the new plan; but the observations at Berkeley were maintained on the same plan as before, as there was nothing inconsistent with this in the new form, with the result that the record kept by the university is exceptionally complete.

In addition to the reports which have been sent to the Weather Bureau and printed in its publications, the university has issued a monthly meteorological synopsis of Berkeley regularly since the beginning of 1887. General synopses have been prepared by Professor Leuschner, the director of the Students' Observatory, and published at five-year intervals, which have summarized the results, as shown by the monthly synopses, up to the date of the general summary. The monthly synopses have been continued by the department of geography in a somewhat enlarged form. It is also proposed to publish an annual report in conformity with the suggestion of the International Meteorological Committee. The original record is in such good condition that, when it was decided to change the method of compiling and stating some of the data in order to bring the form of the synopsis into accord with the better practise, this could be easily accomplished without the use of approximations, and without breaking the series.

There is no scientific work which will continue itself for any considerable length of time without the persistent efforts of men. The meteorological work at Berkeley depends largely upon the efforts of the directors and the Students' Observatory. With the advice of the signal service and the approval of the University of California Professor Frank Soulé, the first director, conceived the idea of making meteorological observations at the observatory, and began the work which has continued since that time. In 1892 he was succeeded as director by Professor A. O. Leuschner, who has maintained the record at its high standard for the past twenty years. The actual observations have been made by various members of the staff of the observatory; and their faithful and punctual performance of an exacting and often unin-

teresting routine duty gives the record its value.

The meteorological work has now come under the direction of the writer as a part of the work of the department of geography. The observations are made at 8 A.M. and 8 P.M., 120th meridian time, besides which there are continuous records of pressure, temperature and relative humidity from the recording instruments. The eye observations are now as follows: wet and dry bulb thermometer readings, maximum and minimum temperatures for the preceding twelve hours, air pressure, wind direction and estimated velocity, amount of cloud, weather and precipitation during the preceding twelve hours. The data are summarized and published monthly in the *Meteorological Synopsis* of Berkeley and a monthly report is made to the United States Weather Bureau on the regular form of report for the cooperative observers.

The University of California has for Berkeley and for Mount Hamilton meteorological records of considerable length and more complete than exist for many places in the United States not regular stations of the Weather Bureau. In a state where climate is such an important factor in the life of the people as it is in California, it is proper that the educational institutions, but above all the state university, should pay more than ordinary attention to meteorology. WILLIAM G. REED

BERKELEY, CAL.,
March 1, 1913

REVIEW OF FOREST SERVICE INVESTIGATIONS¹

THE new periodical issued by the Forest Service, the *Review of Forest Service Investigations*, is the direct outcome of the standardization and coordination of the investigative work done by the service. This investigative work has been placed on a more solid footing by the establishment of investigative committees in each district and of a central investigative committee in Washington.

¹ Volume I., issued March 11, 1913, by U. S. Department of Agriculture, Forest Service.

The *Review* is to serve as a medium for keeping foresters in touch with the scientific work of the profession in America. It will do this by publishing progress reports on major investigations the completion of which will require a number of years, during which time nothing would otherwise be known of them; by publishing full reports on minor studies not of sufficient importance to warrant publication as separate bulletins or circulars, but which nevertheless contain valuable material; and by giving a general view of the scientific forest problems in this country and of what is being done toward their solution. In short, the district and central investigative committees and the *Review* represent the crystallization of the scientific work of the Forest Service; they will make possible a very much higher degree of efficiency.

The present number, being the first, is purely preliminary. It gives no conclusions or reports of investigations, but shows the organization and classification of the scientific work of the Forest Service, the problems in need of solution, and, in general, the manner of attacking these problems. It gives the four main heads, Dendrology, Grazing, Products and Silviculture, with their subdivisions, and describes concisely the problems to be studied under each subdivision. Under Dendrology it shows the importance of studies of tree distribution and of wood structure. Under Grazing, work is being done to collect basic information on the forage, to find methods of reseeding the more valuable kinds, both artificially and naturally, and ways of handling stock so as to increase the carrying capacity of the range, better the condition of the stock, and insure complete utilization of the forage. Under Products, investigations are being carried on to learn the properties of wood, mechanical, physical and structural, so that each kind can be put to its best use and handled most efficiently in manufacturing and kiln drying; to increase the knowledge of preservatives, including the methods of using them and their effects; to develop uses for products of trees other than saw